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About the Cover

Launch of the third Space Shuttle on March 22 from NASA's Kennedy Space Center, Fla. Launch time for the 8-day mission was 11 a.m. EST. In photo below, this flight's prime crew, Jack R. Lousma (left) and C. Gordon Fullerton make a brief statement for the press before departing Ellington Air Force Base, Houston, for Kennedy on March 20. Also present were their families (bottom photo). Left to right: Mary Lousma, Gratia Lousma, Matthew Lousma, and Marie Fullerton. Children in front are Andrew and Molly Fullerton.

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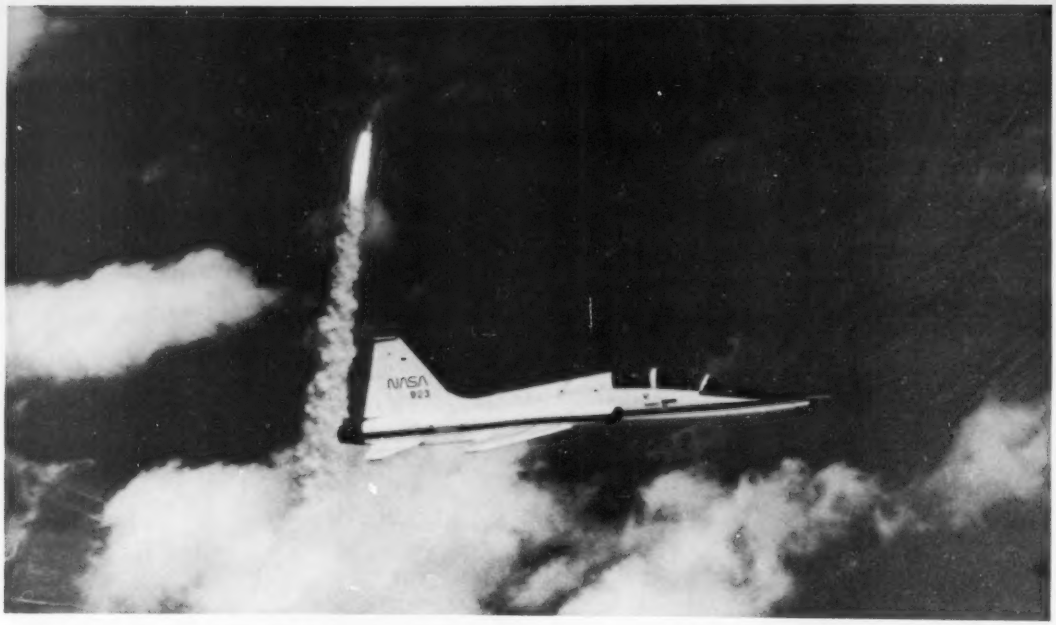
Shuttle Flight 3—Pictorial Highlights

Launch day for the third Space Shuttle, March 22, 1982, launch pad 39A, Kennedy Space Center, Fla. The spacecraft's external fuel tank was unpainted for the first time. Official mission elapsed time for this busiest and most successful test flight was 8 days, 4 minutes, 49 seconds. Below is a helicopter view of the crowds that lined the NASA Causeway for the launch. Public interest in Space Shuttle launches continues to be strong; crowd capacity for this launch was estimated at several hundred thousand spectators.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Page 4, top: Photo taken of the Space Shuttle Columbia from a NASA chase plane. In forefront is a second chase plane from which television imagery was recorded.

Page 4, bottom: UTC Liberty, one of two solid rocket booster recovery ships in the "NASA Navy", tows a spent booster from the third launch of Columbia through Port Canaveral after recovery operations in the Atlantic.

Page 5: Photo of the Columbia's cargo bay made from a live television transmission from the spacecraft on the opening day of the third flight.

When I Fly the NASA Space Shuttle

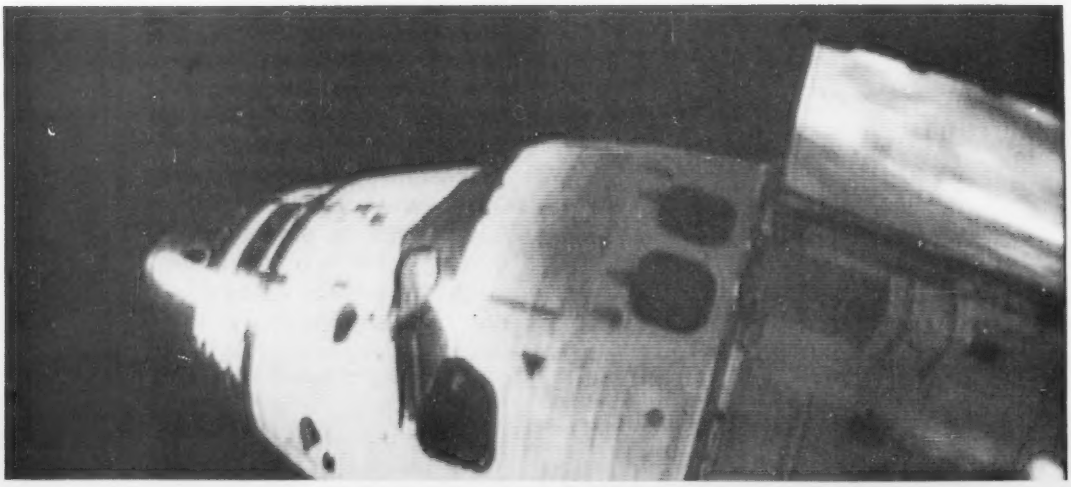
When I fly the NASA Space Shuttle I will be relieved;
Relieved of the times and patience I had to wait. Relieved of the hard work I had to do.
It won't be the life I really new; it will be the life of the final frontier.
But to leave the ground of that big round sphere, known as Earth from way up here.
But that's all dreams, I'll never fear, my wish now, to conquer the "Final Frontier."

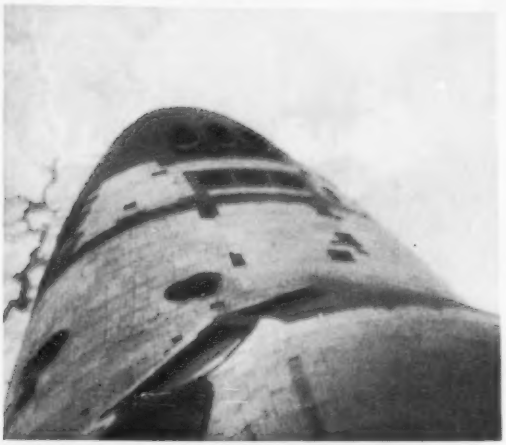
Author Unidentified
Age 5-7 years

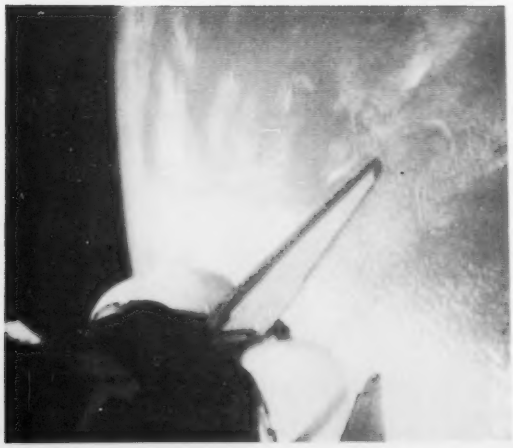
HELLO' NASA

Who are these creatures who dare to enter our shell,
Who come to our heavens where in tranquility we dwell?
Great roaring machines making circles in our space,
Where some day we will greet them face to face.
Cape Canaveral is their aeronautical paradise,
Where the men of NASA do not compromise or sacrifice.
Their genius took them for a walk on our moon,
A giant step for mankind, an astronaut's boon.
Their satellites are sprinkled in our atmosphere
Where celestial bodies in radiant brilliance appear.
We live in orbit where many mysteries abound,
We could have told them that their earth is round.
They strive to visit Venus, Jupiter and Mars,
Treasured planets which have long been ours.
We seek knowledge of their terrestrial gravitation
And our flying saucers challenge identification.
We monitor their exploratory missions, one by one,
But we warn them, "Earth men, stay away from our sun."
We hold master keys to the vault in our sky
A spiritual rendezvous which we glorify.
Their Columbia has twice made history in flight,
A worthy accomplishment, a demonstration of power and might.
So keep blasting off and the future will decide
The merits of your projects and the quantum of your pride.
Your adverturers reflect your tenacity and reliance
May the enlightenment gained be a benefit to science.

David Randolph Milsten
Tulsa, Oklahoma







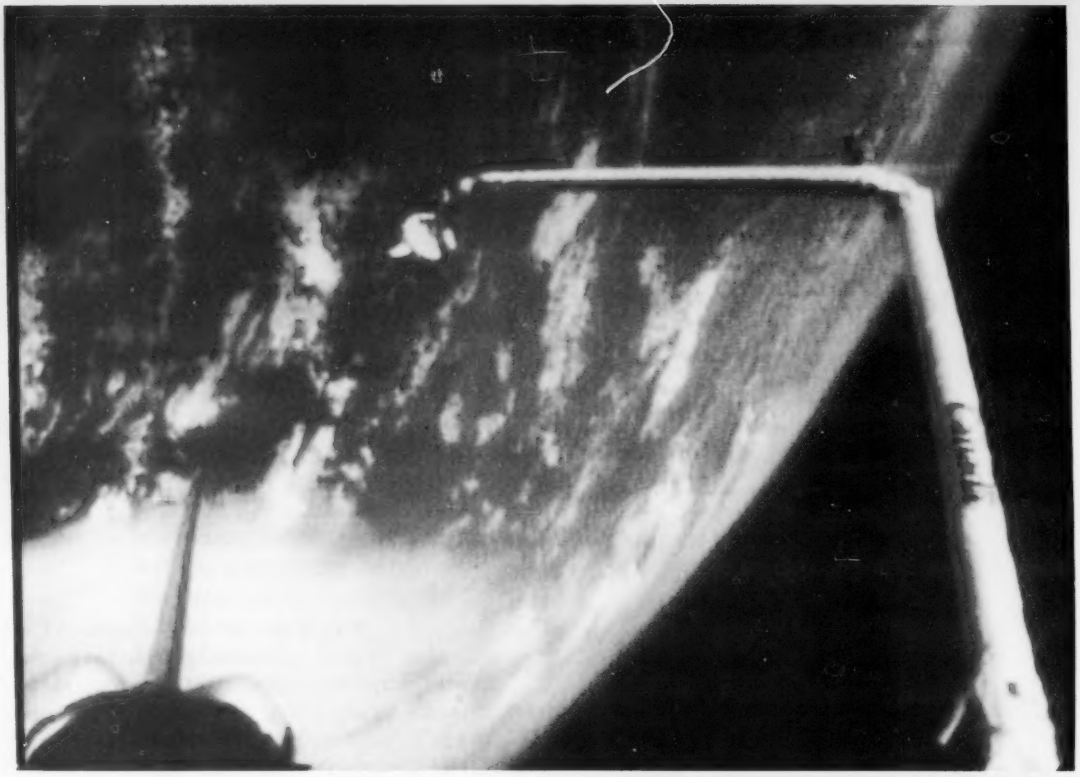
Page 6: High angle view of the Columbia in Earth orbit taken by a television camera mounted on the remote manipulator system. The photo was taken during the second day of the 8-day mission.

Page 7, top left: Photo taken from a live television transmission from the Columbia during the first day of the mission. The land mass at left is part of the East Coast, Chesapeake Bay area. Part of Columbia' cargo bay, orbital maneuvering system pods and vertical stabilizer are visible at lower right.

Page 7, center left: View of Columbia's nose and portion of fuselage taken from a television transmission during the second day of the mission which shows the absence of several white thermal protection system tiles. The tile loss had no impact upon the mission.

Page 7, bottom left: High angle view of Earth taken from Columbia's remote manipulator system elbow camera during the third day of the mission. The Columbia was in a nose-to-sun attitude which allowed for visibility over a large portion of the Earth.

Page 7, top right: From the fourth day in orbit, a photograph of the Space Shuttle's remote manipulator system deployed with the Plasma Diagnostics Package. This was the first time the robotic arm grappled and maneuvered a payload in space. The Plasma Diagnostics Package, part of the OSS-1 payload, is a comprehensive assembly of electromagnetic and particle sensors developed by scientists at the University of Iowa.



Page 8, top: Another view of the PDP payload deployed during a series of tests performed on day four of the mission.

Page 8, bottom left: View of the third Shuttle prime crew at the aft work stations of the orbiter: commander Jack Lousma at foreground; pilot Gordon Fullerton at back.

Page 8, bottom right: Watching Dad in space from Johnson Space Center is Andrew Fullerton.

Page 9: Touchdown of Columbia at White Sands Missile Range, Tuesday, March 30, at 9:05 MST. Poor weather conditions shifted the landing site from Edwards Air Force Base, Calif., to the New Mexico site. Columbia had made 129 orbits of the Earth and had traveled approximately 3.4 million miles.

Key Personnel Changes

Andrew J. Stofan has been named Director of the Lewis Research Center in Cleveland, Ohio, succeeding Dr. John F. McCarthy, Jr. Stofan was Acting Associate Administrator for Space Science at NASA headquarters in Washington, D.C., from October 1980 until last month, when Dr. Burton I. Edelson became Associate Administrator of the new Office of Space Science and Applications. For the past month, Stofan has been serving as advisor to Edelson in structuring the new office.

Prior to his assignment to NASA headquarters in 1978, Stofan had been Director of Launch Vehicles at the Lewis Center.

Stofan will assume his new duties July 1, at which time McCarthy will return to the Massachusetts Institute of Technology, Cambridge, as Professor of Aeronautics and Astronautics.

Dr. Noel W. Hinners, Director of the National Air and Space Museum, has been appointed Director of NASA's Goddard Space Flight Center, Greenbelt, Md., effective June 14. Hinners succeeds A. Thomas Young who left Goddard March 22 to become vice president of research and engineering for Martin Marietta Aerospace, Bethesda, Md. Dr. Leslie H. Meredith, Director of Applications at Goddard will serve as the Center's Acting Director in the interim.

Hinners became Director of the National Air and Space Museum in April 1979. Prior to that he was Associate Administrator for Space Science at NASA Headquarters from June 1974 to April 1979 and he served as Director of Lunar Programs in the Office of Space Science. He joined NASA in 1972 as Deputy Director and Chief Scientist, Apollo Lunar Exploration.

Hinners served as chairman of NASA's Lunar Dust Erosion Study Committee in 1969-70, and the Apollo Photo Data Users Group in 1971. He was also chairman of the Apollo Site Committees for Apollo 12-17 missions. He currently chairs NASA's Solar System Exploration Committee.

Daniel J. Fink, senior vice president for corporate planning and development with General Electric Co., Fairfield, Conn., has been named chairman of the NASA Advisory Council by agency Administrator James M. Beggs. He assumed the chair on March 11.

The NASA Advisory Council is composed of senior industry executives, leading scientists and eminent public figures and serves as the agency management's senior advisory group on aerospace policy and program planning. As chairman, Fink will direct the advisory activities of the council itself as well as those of six committees that report to the council.

Prior to his present assignment with General Electric, Fink had been the company's vice president and group executive for its aerospace group. Earlier, when he was vice president and general manager of General Electric's space division, he received the Collier Trophy, the nation's most prestigous aerospace award, for his contributions to the Landsat Program.

Dr. Bruce C. Murray has announced his resignation later this year as Director of NASA's Jet Propulsion Laboratory, Pasadena, Calif. A search for his successor is underway. Dr. Murray's announcement came as he entered his seventh year in the position. A member of the California Institute of Technology faculty since 1960, Dr. Murray became JPL's Director on April 1, 1976. He said he plans a year-long sabbatical, including extensive travel and writing. During the past six years, JPL has conducted the mission operations of the Viking Mars orbiters and landers and completed development of the two Voyager spacecraft which explored Jupiter and Saturn. The Laboratory managed the earth satellite projects, Seasat and Solar Mesosphere Explorer; is managing the Infrared Astronomy Satellite; and is developing the Galileo Jupiter orbiter and probe.

Prior to his appointment to head JPL, Dr. Murray was associated with the first space explorations of Mars, Venus and Mercury. From 1961 to 1973, he was co-investigator on the television science experiments on the Mariner 4, 6, 7, and 9 Mars mis-

sions. He was team leader of the 1974-75 Venus and Mercury television science investigations by Mariner 10.

Gerald D. Griffin, vice president of Scott Science and Technology, Inc., Scottsdale, Ariz., will succeed Dr. Christopher C. Kraft, Jr., as Director of NASA's Johnson Space Center, Houston, at the end of this year. Kraft announced his resignation from the agency in April. He has headed the Johnson Center for the past decade. Griffin left NASA in August to join Scott Science; prior to this position he served as the Deputy Director of NASA's Kennedy Space Center.

From July 1980 until August 1981, Griffin filled a dual role as NASA Headquarters Acting Associate Administrator for External Relations and Deputy Director of Kennedy, spending approximately 25 percent of his time at KSC.

In other NASA positions, Griffin served as Deputy Director of Dryden Flight Research Center, Edwards, Calif. and as a flight director at Johnson Space Center on all 11 Apollo missions. He was lead flight director on Apollos 12, 15 and 17.

Satellite Detects Drop in Sun's Energy; Possible Factor in Weather on Earth

An 18-month decrease in the Sun's energy output, recently detected by a NASA satellite, may have been a factor in this year's unusually harsh winter, according to a scientist at NASA's Jet Propulsion Laboratory, Pasadena, Calif.

This winter's severe weather conditions in the United States, coupled with results from an experiment on the Solar Maximum Mission satellite, may be the first direct observation of a cause and effect relationship between the Sun's energy output and changes in Earth's weather and climate, according to JPL Solar Max investigator, Dr. Richard Willson.

A persistent decrease of a tenth of a percent in the total amount of solar energy reaching Earth (called solar irradiance) was detected over an 18-month period from February 1980 to August 1981 by the Active Cavity Radiometer Irradiance Monitor experiment on the satellite.

Climatologists are already studying the results of the experiment which will be correlated with such global climate indicators as average temperatures, ice coverage and sea level to evaluate the effects of the drop in solar irradiance.

A systematic increase or decrease in the Sun's release of energy—as little as one half percent per century—can produce vast changes in Earth's climate. Scientists believed that a one percent decrease would lower Earth's mean global temperature by more than 1 degree Kelvin (2 degrees Fahrenheit). According to some models, a decrease in solar energy of less than 10 percent could effectively freeze Earth's entire surface.

Nearly all life forms on Earth exist within the 10 kilometers (6.2 miles) above and below mean sea level. The temperatures within this thin environmental shell, called the biosphere, are determined by the amount of energy received by the Sun and delicate interactions between the atmosphere, ocean and land masses.

The climatic effects of short-term variations in solar irradiance are moderated by the heat capacity of the ocean and atmosphere. A long-term increase or decrease, however, can eventually change the temperature of the ocean and atmosphere enough to change the weather and climate.

"These kinds of small but persistent trends in solar irradiance are believed to have been causes of climatic changes in the past," Wilson said.

Solar magnetic activity reaches a maximum approximately every 11 years. The peak of the current solar cycle (called solar cycle 21), occurred in early 1980, about the time the Solar Maximum Mission satellite was launched. The irradiance decrease detected by the monitor may be related to the general decline in solar activity since then. However, the decrease might be an indication of a longer-term trend in the Sun's irradiance. Years of careful measurements would be required to identify such a trend.

In its two years of operation, the irradiance monitor also observed short-term increases and decreases, lasting from days to weeks, in the amount of solar energy that reaches Earth. Analysis indicates the decreases are the effects of sunspots, dark, cooler patches on the Sun, while increases are caused by faculae, which are bright, extra-hot solar regions.

The monitor also detected evidence of solar oscillatory phenomena—global pulsations whose effects extend deep into the Sun. The oscillations had a five-minute periodicity. These five-minute oscillations match ground-based observations discovered in the 1970s. Study of this phenomenon, so-called

"solar seismology," will provide new information on the inner workings of the Sun that cannot be obtained by other means.

During most of Earth's history, the climate appears to have been considerably warmer, with average global temperatures about 25 C (77 F). The current average global temperature is 15 C (59 F).

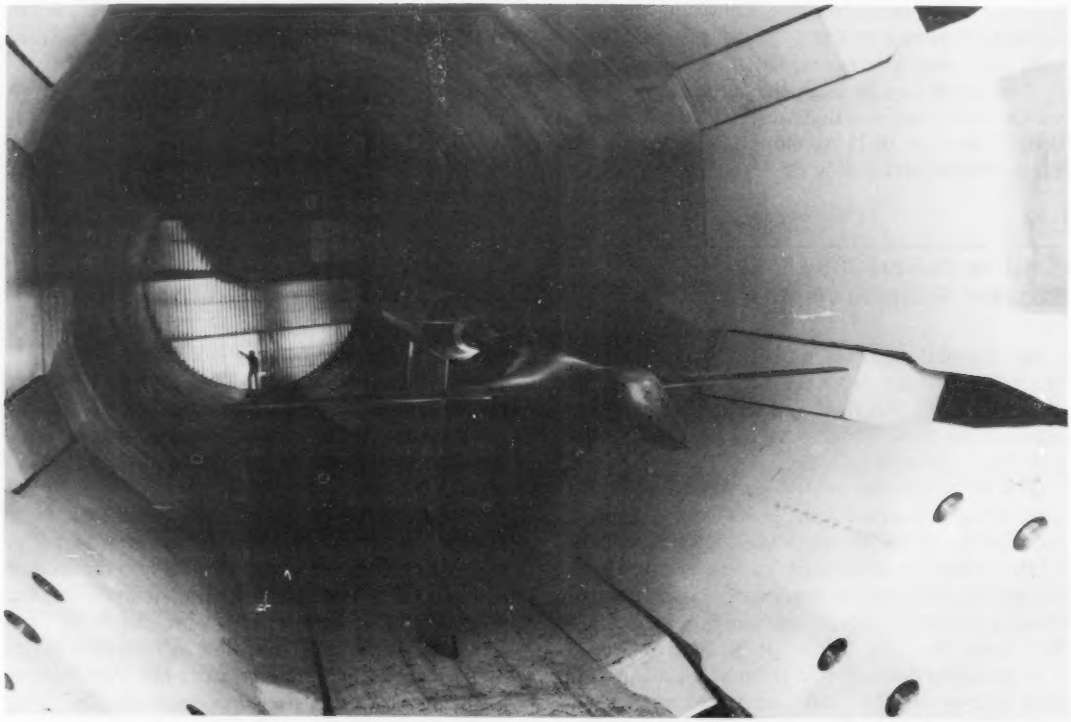
A gradual trend to a cooler climate began about 100 million years ago, resulting in the glacial climate of the last 20 million years. At least four major glacial epochs, each lasting nearly 100 million years, have occurred in the last billion years. The last epoch ended 250 million years ago. The present glacial period may yet prove to be another major epoch.

The Solar Maximum Mission was launched Feb. 14, 1980. In December, after 10 months of normal operation, the satellite's attitude control system lost its capability to point precisely at the Sun. A less precise pointing technique was subsequently achieved by spinning the spacecraft so that it rotates every six minutes. In this configuration, three of the satellite's seven instruments continue to acquire useful data.

The Sun crosses Solar Max's Active Cavity Radiometer Infrared Monitor field of view several times per orbit, providing an adequate quality and quantity of data for the experiment's primary mission objectives, though the data are deficient in some solar physics information (like the observation of solar oscillations).

While the spin-stabilized pointing allows continued study of the Sun, the satellite's 550-km (340-mi.) orbit is slowly decaying due to atmospheric drag.

At the present rate of decay, the Solar Maximum Mission satellite will reenter Earth's atmosphere in 1984. Its demise will leave at least a three-year gap



Wind Tunnel Testing—Model of the B-1 bomber mounted for testing in NASA Langley Research Center's Transonic Dynamics Wind Tunnel. Work on this tunnel, the world's first aeroelastic testing tunnel, was completed early in 1960 after eight years of intensive design and calibration. Langley is one of NASA's lead aeronautics centers, specializing in aeronautical and space structures and materials; advanced concepts and technology for future aircraft; aerodynamics of reentry vehicles; space environmental physics; and improved supersonic flight capabilities.

in the precise record of solar irradiance observations made for the National Climate Program. The earliest successor experiment to the irradiance monitor is planned for deployment on NASA's Upper Atmospheric Research Satellite (UARS) in 1987.

Solar Maximum Mission was the first NASA satellite designed to be retrieved by the Space Shuttle. An effort to retrieve the satellite, repair it on orbit and redeploy it is being studied by NASA. The rejuvenated satellite would allow scientists to observe a wide range of solar phenomena in a different part of the solar activity cycle and sustain solar irradiance monitoring with the precision required for climate studies.

Authorization for the proposed Solar Maximum Mission repair mission is currently under consideration by Congress.

The irradiance monitoring experiment is conducted by the Jet Propulsion Laboratory as part of the Environmental Observations program of NASA's Office of Space Science and Applications. Solar Maximum Mission is managed by NASA's Goddard Space Flight Center, Greenbelt, Md.

Astonomers Detect Violent Ejection From A Star Near Sun

What is believed to be the first direct evidence of a violent ejection or jet from a star relatively close to the Sun has been detected by astronomers at NASA's Goddard Space Flight Center, Greenbelt, Md., the University of Maryland and the Lick Observatory at the University of California.

Most of the jets that are observed by astronomers indicate violent ejection of matter from the center of active galaxies or quasars. This most recent observation, however, reveals an extraordinary jet structure in a binary star system near the Sun, known to astronomers as the star R Aquarii. In contrast to the only other star known to have jet structure in our galaxy, SS 433, R Aquarii is much closer to the Sun, a distance of only 750 light years.

Dr. Andrew Michalitsianos of Goddard describes the jet, seen with the Very Large Array radio telescope located at Socorro, N.M., as "an extended, well collimated (directional) jet which is coincident with a similar structure seen in visible light by Dr. George Herbig with the 305-centimeter (120-inch) telescope at the Lick Observatory. This jet has a length of about 20 times the size of our solar system."

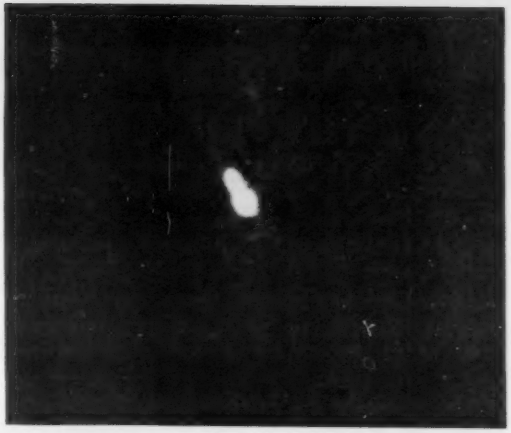


Photo taken by Dr. George Herbig of Lick Observatory, University of California on Oct. 18, 1980 of the red variable R Aquarii. The jet is the protruding feature extending from the image of the central star. The surrounding tenuous nebula has been known to exist around R Aquarii for a number of decades and is believed to be the result of tidal forces between the binary star components and material expulsion from the cool red giant star in the system.

Dr. Minas Kafatos, on leave from George Mason University, Fairfax, Va., who also is at Goddard, estimates that the material in the jet could be moving at 2,000 kilometers (1,080 miles) per second.

"We believe that the presence of a jet in R Aquarii is evidence for an accretion disk of material captured by an unseen star companion of the cool red variable R Aquarii," said Kafatos. The accretion disk, estimated to have a diameter 25 times the Earth's distance from the Sun, would be just observable with Space Telescope (due to be launched on the Space Shuttle in 1985) because of the proximity of this system to the Sun. Therefore, R Aquarii may be the only object in which astronomers can directly examine the formation of jet structure.

As Star SS 433 is 20 times farther from the Sun than R Aquarii, it would not provide a favorable opportunity for observation, astronomers said.

In a related development, radio observations of the jet structure by Robert Sopka of the University of Maryland, they said, showed a previously unknown radio source. If proven to be associated with R Aquarii, it may be material previously ejected during an outburst seen in the early 1930s, they said.

New observations are planned by the Goddard astronomers using NASA's orbiting International Ultraviolet Explorer telescope satellite.

Crews Named For Next Six Shuttle Missions

Astronaut crews for the fourth through ninth flights of the Space Shuttle have been announced by NASA. Among those selected will be NASA's first woman in space (flight seven) and the first black astronaut (flight eight) in space. Crewmen for **STS-4** are **Thomas K. Mattingly**, commander, and **Henry W. Hartsfield**, pilot. STS-4 is planned for launch in late June or early July for a duration of approximately seven days. It will be the last of four orbital flight test missions verifying Shuttle hardware and software subsystems.

STS-5 is scheduled for mid-November as a five-day mission to deploy commercial communications satellites. It will be the first flight to employ mission specialist astronauts. Mission commander is **Vance D. Brand** and **Robert F. Overmyer** is pilot. Mission specialists are **Dr. Joseph P. Allen** and **Dr. William B. Lenoir.**

Columbia is the spacecraft for both missions.

STS-6 will be the first flight of the Shuttle orbiter Challenger and is planned for January 1983. It will be a two-day mission to deploy NASA's Tracking and Data Relay Satellite, one of an eventual two-satellite system which will provide more comprehensive voice and data coverage between the ground and orbiting Space Shuttles. The crew is **Paul J. Weitz**, commander; **Karol J. Bobko**, pilot; **Donald H. Peterson** and **Dr. Story Musgrave**, mission specialists.

Crewmembers for **STS-7** are **Robert L. Crippen**, commander, and **Frederick H. Hauck**, pilot. **Mission specialist astronauts will be John M. Fabian** and **Dr. Sally K. Ride**. STS-7 is to be a six-day flight by the orbiter Challenger, with a planned launch in April 1983. Its payloads are to be a German shuttle pallet satellite (SPAS), the second Office of Space and Terrestial Applications instrument package (OSTA-2), a Canadian communications satellite (TELESAT-F) and an Indonesian communications satellite (PALAPA-B1).

STS-8 is scheduled for launch in July 1983. Announced as mission commander is **Richard H. Truly** and as pilot, **Daniel C. Brandenstein.** Mission specialists will be **Dale A. Gardner** and **Guion S. Bluford, Jr.** This three-day mission is to be the third flight of the orbiter Challenger. Payloads will be an Indian communications satellite (INSAT 1-B) and NASA's tracking and data relay satellite (TDRS-B), the second and final element in a system to give nearly full-time voice and data communication between orbiting Space Shuttles and mission control.

The first flight of Spacelab—the joint project between NASA and the European Space Agency—is presently scheduled for launch in September 1983. Mission commander for the seven-day flight of **STS-9** is to be **John W. Young** and pilot will be **Brewster H. Shaw, Jr.** Mission specialists will be **Dr. Owen K. Garriott** and **Dr. Robert A. Parker**. Additionally, two payload specialists—one each from NASA and the European Space Agency—will be named at a later date.

Backup crews will no longer be assigned to Space Shuttle flights. A pool of experienced Shuttle pilots now exists, and a crewman could be replaced with minimal impact to crew training and scheduling.

Thomas K. Mattingly

Henry W. Hartsfield

STS-4

Vance D. Brand

Robert F. Overmyer

Joseph P. Allen

William B. Lenoir

STS-5

Paul J. Weitz

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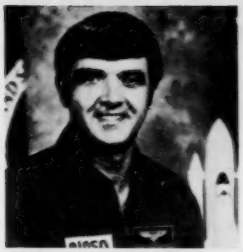

Daniel C. Brandenstein

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STS-6

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STS-8

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Frederick Hauck

STS-7

John W. Young

Brewster H. Shaw, Jr.

John M. Fabian

Sally K. Ride

STS-8

Owen K. Garriott

Robert A. Parker

STS-9

Shuttle Thermal Protection System Being Improved

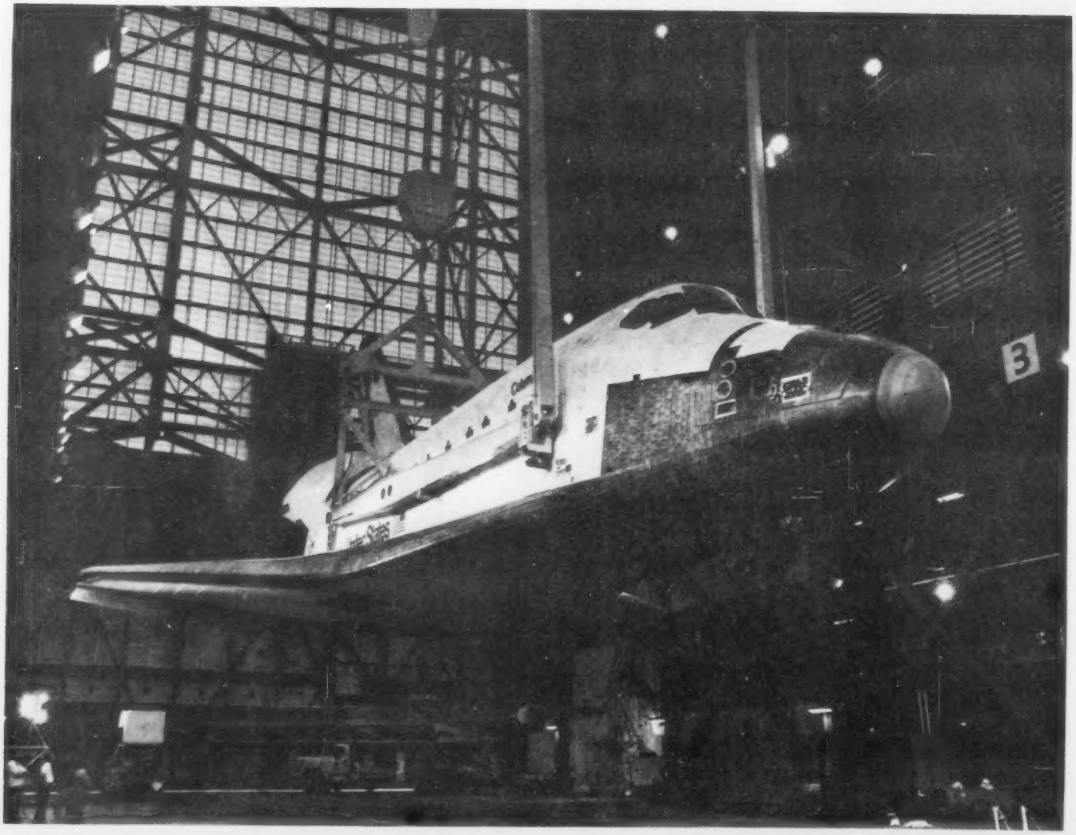
Lighter, stronger and more cost-efficient second generation materials, developed at NASA's Ames Research Center, Mountain View, Calif., are improving the Space Shuttle's thermal protection system. The thermal protection system is one of the more critical Shuttle elements as it protects the spacecraft from the extreme temperatures it encounters on its Earth-circling missions.

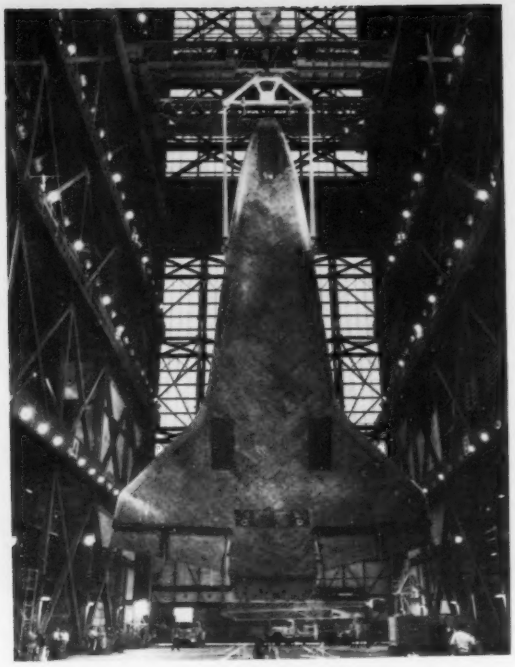
Some of the new materials were installed for the second mission of the orbiter Columbia, which made its third trip into space on March 22 from Kennedy Space Center, Fla. Other of the materials will be installed in stages on Columbia and the three additional Shuttle orbiters over the next several years: Challenger, now under construction with delivery expected this summer; and Discovery and Atlantis, scheduled for delivery in 1983 and 1984.

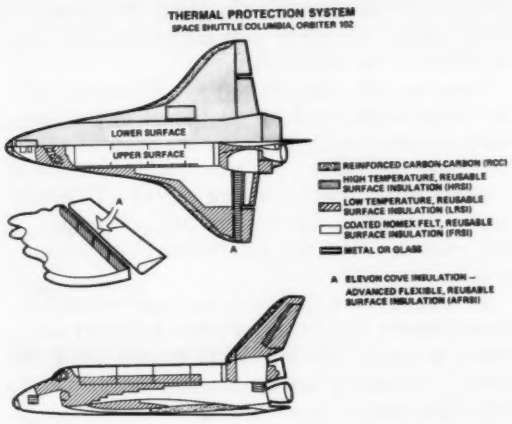
The Shuttle thermal protection system consists of tiles and other refractory materials applied to the outer shell of the orbiter to protect its aluminum and graphite-epoxy skin from extreme temperatures. Temperatures on a Space Shuttle flight may range from −110 Celsius (−170 Fahrenheit) in space to nearly 1,648 C (3,000 F) at some points during reentry.

Shuttle orbiter Columbia has had a silica glass quilt, called Advanced Flexible Reusable Surface Insulation installed over 1.85 square meters (20 square feet) of its elevon cove, replacing the Felt Reusable Surface Insulation which originally covered the area.

This felt insulation had to be replaced because temperatures in the elevon cove area reached 816 C (1,500 F) and the felt was designed for areas no hotter than 398 C (750 F). Plans had been to install the advanced flexible type in some areas on the next orbiter, Challenger, but the overheating brought a decision to add the new materials for the second flight of Columbia last November.



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REINFORCED CARBON-CARBON (RCC)
HIGH TEMPERATURE, REUSABLE SURFACE INSULATION (HRSI)
LOW TEMPERATURE, REUSABLE SURFACE INSULATION (LRSI)
COATED NOMEX FELT, REUSABLE SURFACE INSULATION (FRSI)
METAL OR GLASS
A ELEVON COVE INSULATION — ADVANCED FLEXIBLE, REUSABLE SURFACE INSULATION (AFRSI)

Orbiter Columbia in Kennedy Space Center's Vehicle Assembly Building showing side and underviews of the more than 30,000 thermal protection system tiles which cover the spacecraft's surface. Above is a diagram showing placement of the new advanced flexible insulation tile on the Columbia.

The advanced type is tougher, lighter and cheaper than earlier tile heat shields. It was conceived by Ames and produced by Manville Building Materials Corp., Denver, Colo. A square foot of new insulation costs about $200, compared to approximately $1,000 a square foot for tile materials.

On Challenger, the advanced flexible insulation will be installed on the orbital maneuvering system pods and will partially replace low temperature reusable surface insulation tiles developed and manufactured by Lockheed Missiles and Space Co., Sunnyvale, Calif.

On orbiters Discovery and Atlantis, the advanced flexible type will replace all the low temperature insulation and parts of the felt type, covering more than 250 sq. m. (2,700 sq. ft.).

Also on these future orbiters, another new material called Fibrous Refractory Composite Insulation (FRCI-12, 12 pounds per cubic foot) will replace LI-2200 tiles. Both of these materials were developed by Ames and are manufactured by Lockheed. The new fibrous insulation is lighter and stronger than LI-2200.

The fibrous type will save about 450 kilograms (1,000 pounds) on Discovery and Atlantis.

Four principal types of materials comprised the original thermal protection system: felt reusable surface insulation effective for temperatures less than 398 C (750 F); low temperature reusable surface insulation tiles, covered with a white borosilicate glass coating effective from 371 C (700 F) to 648 C (1,200 F); high temperature reusable surface insulation, covered with a black reaction-cured glass coating which is used for 648 (1,200 F) to in excess of 1,260 C (2,300 F); and reinforced carbon-carbon, effective for temperatures up to 3,000 F.

The low and high temperature tiles come in two densities: the LI-2200, 22 pounds per cubic foot, and LI-900, nine pounds per cubic foot. The latter material was developed and is manufactured by Lockheed.

The high temperature insulation is covered with the black, reaction-cured borosilicate glass coating developed by Ames to protect the high temperature areas, about 43 percent of the total surface of the orbiter. The white, borosilicate-coated low temperature tiles are located primarily on the upper surface of the orbiter.

Another Ames development used in the thermal protection system is the Ames gap filler, which fills nearly 5,000 gaps between tiles, where it prevents hot gas from reaching the Shuttle's aluminum skin.

Solid Rocket Booster Modification Proposed

NASA plans to make a change to the Space Shuttle's solid rocket boosters that will reduce their weight substantially and provide an increase in the Shuttle's payload carrying capacity by about 2,720 kilograms (6,000 pounds).

Pending approval for reprogramming of funds, NASA plans to replace eight of the 11 metal segments of the current booster motor case with four segments made from composite filament material. Other motor components, including the metal forward and aft domes and the external tank attach segment of the metal case, would remain unchanged.

A request for proposals has been issued for design and development of the filament wound case.

The new filament wound case is needed for high performance launches primarily into near-polar orbit from Vandenberg Air Force Base, Calif. The lightweight motor case will help compensate for reduced lift capabilities when launches from the West Coast cannot take advantage of the added velocity provided by the Earth's rotation. The filament wound case can also be used to boost extra heavy payloads into Earth orbit from Kennedy Space Center, Fla.

The lightweight case for the boosters was one of several options studied by NASA to increase the Shuttle's payload capacity. First use of the motor would be in late 1985.

Should the plans be approved, a series of test firings using filament wound case configured solid rocket motors will be conducted by the Thiokol Corp., Wasatch Div., Brigham City, Utah, under the direction of NASA's Marshall Space Flight Center, Huntsville, Ala.

Selection Begun In Second Shuttle Student Project Competition

Up to 200 semifinalists have been selected in the second national Space Shuttle Student Involvement Project, a joint effort of NASA and the National Science Teachers Association.

The object of the project is to stimulate the study of science and technology in grades 9 through 12 by engaging students in a competition to develop payload experiments suitable for flight aboard the Space Shuttle. The contract to conduct this competition and select the winners was awarded last summer by NASA to the National Science Teachers Association, with headquarters in Washington, D.C.

An experiment by student Todd E. Nelson of Rose Creek, Minn., a finalist from the first national competition, flew on the third Shuttle mission launched March 22 from Kennedy Space Center, Fla.

Since announcement of the second competition in August, the National Science Teachers Association has received more than 86,000 requests for contest materials.

Interested students first submit experiment proposals to their high school science teacher for review and screening for adherence to the rules of the competition. Teachers submit all eligible projects to the National Science Teachers Association for consideration.

By Feb. 1, the Association had received 2,900 entries in the competition. These proposals were grouped into 10 geographic areas or regions determined by the Association.

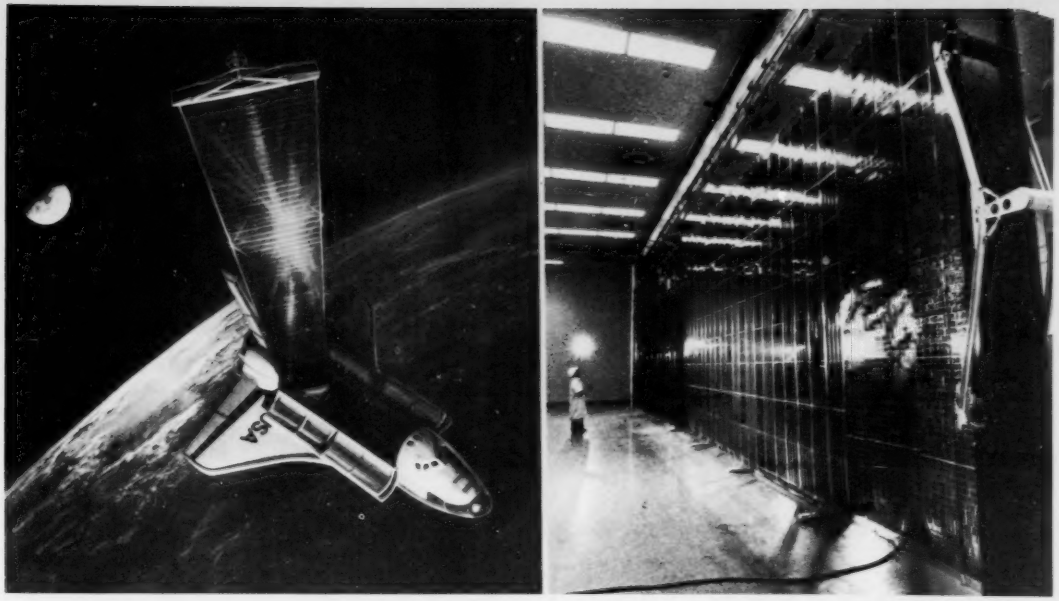
Interdisciplinary teams of teachers, scientists and engineers, selected by the National Science Teachers Association, were established to review these proposals at the 10 regional levels. Up to 20 students from each of the regions were selected for the semifinals of the competition.

From the 200 semifinalists, up to 20 projects will be selected on the basis of scientific or engineering merit for potential flight aboard the Space Shuttle. These national winners and their teachers will attend a special educational conference at NASA's Kennedy Space Center, Fla., late this summer. All competition entrants will receive a certificate of participation.

To broaden participation in the program, NASA is encouraging U.S. industrial firms and other non-NASA groups to sponsor student winners and assist them in developing their experiments for flight and post-flight analysis and reporting.

Winning student experiments will be assigned to specific Shuttle flights as the experiments are ready, as Shuttle payload space is available and as future Shuttle flights are confirmed.

A third Space Shuttle Student Involvement Project contest will open in September with that series of regional conferences to be held in March 1983. Selection of new groups of student winners will be made in May 1983.



Capturing Energy from the Sun – Artist concept (left frame) of a huge experimental solar array wing (right frame) developed by Lockheed Missiles and Space Company that will fly aboard the Space Shuttle in 1984. Tests conducted during the flight will verify that large area solar arrays are capable of supplying significant amounts of power for Shuttle operations. Measuring 105-ft. long by 13½-ft. wide, the wing will be folded like an accordion in the Shuttle cargo bay. Attached to the cargo bay, it will be extended and retracted several times in space to check its structural and dynamic characteristics and its electrical performance. When fully extended and fully populated with solar cells, the array wing's 84 electrical modules convert energy from the Sun to produce 12.5 kilowatts of power.

Space Shuttle Launches for 1982

Orbiter	Launch Date	Launch Site	Payload
*Columbia (OV-102)	March 22	KSC	OSS-1
Columbia (OV-102)	June 27	KSC	DOD 82-1
Columbia (OV-102)	November	KSC	SBS-B, Telesat-E

*Successful launch

Expendable Launches for 1982

Name	Launch Date	Vehicle	Range	Mission Remarks
*RCA-C[1]	January 15	Delta	ESMC	RCA communications. Reimbursable.
*Westar-IV	February 25	Delta	ESMC	Western Union communications. Reimbursable.
*Intelsat V-D	March 4	Atlas Centaur	ESMC	Intelsat communications. Reimbursable.
*Insat 1A	April 10	Delta	ESMC	India communications. Reimbursable.
Westar-V	June 8	Delta	ESMC	Western Union communications. Reimbursable.
NOAA-E/SAR	June	Atlas-73E	WSMC	NOAA/SAR weather. Reimbursable.
Navy 21	June	Scout	WSMC	DOD transit. Reimbursable. Callup.
Landsat-D	July 9	Delta	WSMC	NASA earth resources applications.
Intelsat V-E	July	Atlas Centaur	ESMC	Intelsat communications. Reimbursable.
Telesat-G (Anik-D1)	August	Delta	ESMC	Canada communications. Reimbursable.
RCA-E	October	Delta	ESMC	RCA communications. Reimbursable.
San Marco-D/L	November	Scout	ESMC	International cooperative/Italy.
Intelsat VA-A	December	Atlas Centaur	ESMC	Intelsat communications. Reimbursable.

*Successful launch

Another Dividend from Air and Space

Research and development in aeronautics and space have provided numerous benefits for all Americans—and at a tiny percentage of the tax dollar. Here is an example:

Aircraft Fuel Economy

Soaring fuel cost is the largest problem confronting commercial aviation today. Scientists at NASA's Lewis Research Center, Cleveland, are conducting research on advanced turboprop engines which offer inherently better fuel economy than jet engines.* Old turboprop engines with 4-bladed propellers produced excessive noise and vibration in high speed operation but did feature more efficient fuel use. In the days of inexpensive fuel, jets produced faster, quieter and more comfortable rides than the turboprops.

These reshaped propellers could enable turboprop aircraft to fly at or near jetliner speeds and altitudes and provide fuel consumption reduction of 30-40 percent. The accompanying photo shows a propeller model undergoing wind tunnel testing at Lewis. At right an engineer operates a laser velocimeter system which measures air velocities in the propeller's flow field.

*NASA does not endorse commercial products developed as a result of its Technology Utilization or Patent Licensing Programs, but it does encourage the widest possible use of its technology.

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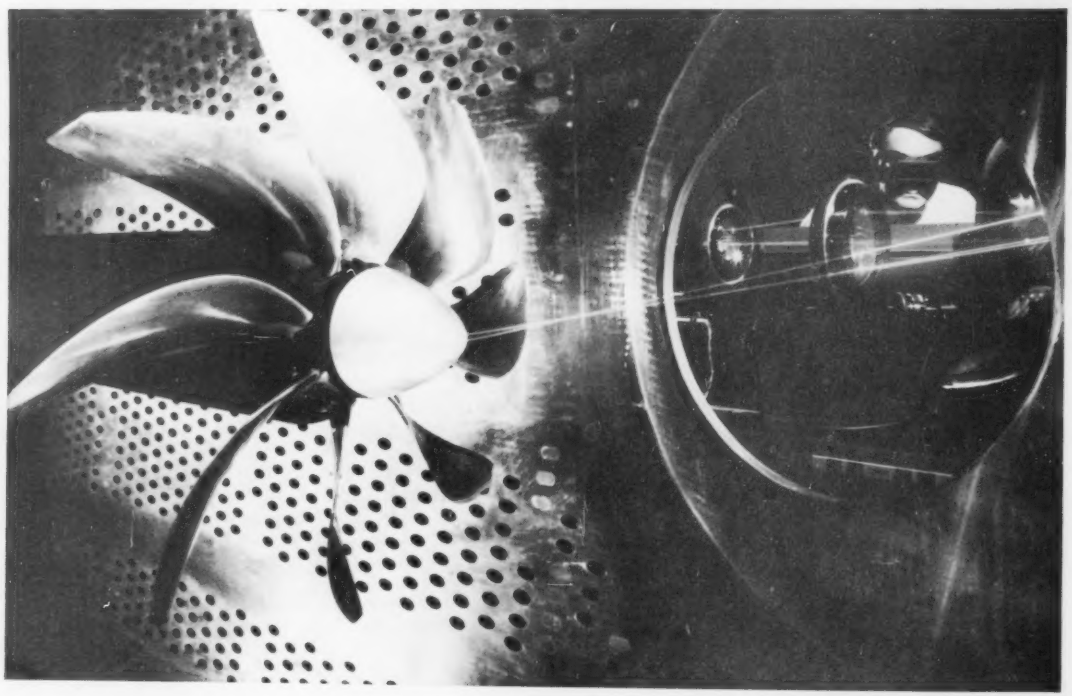
For the benefit of all . .



*U.S. GOVERNMENT PRINTING OFFICE : 1982 0-361-563/111